Chapter 3: Capacity Analysis and Determinations of Facility Requirements

3.0 Introduction

Preceding chapters described existing airport facilities at PMP and presented forecasts of activity anticipated during the 20-year planning period. Using the forecasts and the airport's physical and operational characteristics, permits evaluation of the airport's capacity and determination of the facilities needed to serve local air transportation needs. Those subjects are discussed in this chapter.

3.1 Capacity Analysis

Three aspects of the airport were addressed: ability to process aircraft operations; adequacy of runway length and width; and coverage of crosswinds provided by the existing runway system.

3.1.1 Airfield Operational Capacity

Several techniques have been developed for analysis of airfield capacity. Typically, an approach described in FAA Advisory Circular 150/5060-5, Airport Capacity and Delay is used. This methodology is also incorporated in software available from the FAA, i.e., Airport Design Version 4.2D.

Two general capacity parameters were examined at PMP. The first, Annual Service Volume (ASV), is defined by the FAA as "... a reasonable estimate of an airport's annual capacity. It accounts for differences in runway use, aircraft mix, weather conditions, etc., that would be encountered over a year's time." Capacity "... is a measure of the maximum number of aircraft operations which can be accommodated by the airport or airport component in an hour."

The methodology includes several assumptions used in determining Annual Service Volume (ASV) and hourly capacity. These are as follows:

- Arrivals equal departures.
- The percentage of touch-and-go operations is between zero and 50 percent of total operations.
- There is a full-length parallel taxiway with ample exits and no taxiway crossing problems.
- There are no airspace limitations.
- The airport has at least one runway equipped with an Instrument Landing System (ILS) and has the necessary Air Traffic Control (ATC) facilities and services to carry out

operations in a radar environment.

- IFR weather conditions occur roughly 10 percent of the time.
- Approximately 80 percent of the time, the airport is operated with the runway use configuration that produces the greatest hourly capacity.

It is recognized that PMP does not conform to all the assumptions stated above. Among the differences are the lack of an ILS and the absence of full parallel taxiways for all runways. These would result in a reduction of capacity that would tend to exacerbate any capacity deficiencies identified.

Using the FAA software referenced earlier produced the following results for PMP:

- Annual Service Volume (ASV) = 230,000 operations
- Hourly Capacity (VFR) = 98 operations
- Hourly Capacity (IFR) = 59 operations

Forecasts presented in Chapter 2 indicate that the estimated ASV will be not exceeded during the planning period; operations are estimated to increase to 179,900 by Year 2027. Given the amount of training that occurs at PMP, Hourly Capacity under VFR conditions is forecast to be exceeded by 2012. Annual Instrument Approaches are not forecast to exceed IFR Hourly Capacity.

FAA guidelines suggest that planning for additional capacity should be initiated when an airport reaches 60 percent of capacity and that implementation of recommendations for capacity improvements should occur when 80 percent of capacity has been reached. The forecasts indicate that the 60 percent threshold (.6 x ASV=138,000 operations) will be exceeded by 2012. Hourly capacity is forecast to be exceeded by 2012. These results indicate that this master plan should examine the feasibility of achieving capacity improvements at PMP.

As noted in Chapter 2, helicopter operations are forecast to constitute 12 percent to 14 percent of total activity during the planning period. Options considered to achieve greater capacity should include specific consideration of helicopter activity.

3.1.2 Runway Length and Width Requirements

Adequacy of the existing runway length was reviewed using information from the inventory of existing facilities and the forecasts of aviation demand. The former shows an existing primary runway (15-33) length of 4,418 feet. The forecasts suggest the need to consider a B-II large airplane as the Design Aircraft. Typical of these are the Beechcraft KingAir 200, 300, and 350 and Cessna Citation II.

Primary runway length requirements were calculated using two FAA methodologies. The FAA's Airport Design software includes a routine that estimates runway length requirements based upon local conditions such as airport elevation, temperature, and aircraft types using the airport. Applicable inputs for PMP are runway elevation = 19' MSL and normal mean daily maximum temperature of the hottest month of the year = 91° Fahrenheit (rounded). Using these inputs, the program produces runway length requirements as shown in Table 3.1. The Design Aircraft for PMP is a B-II large airplane. As shown in the table, serving 75 percent of large airplanes (60,000 pounds or less) at 75 percent useful load requires 4,710 feet of runway while a runway length requirement of 4,280 feet is indicated for serving 100 percent of small airplanes with 10 or more passengers seats. The large aircraft using PMP are typically less than 30,000 pounds and more frequently less than 20,000 pounds, so the small aircraft runway standard of 4,280 feet was considered an appropriate option. Consistent with FAA's long-time practice, this length was rounded up to 4,300 feet.

Table 3.1: Runway Lengths Recommended for Airport Design

	Recommended Length
Small airplanes with approach speeds of less than 30 knots	300 feet
Small airplanes with approach speeds of less than 50 knots	800 feet
Small airplanes with less than 10 passenger seats	
75 percent of these small airplanes	2,520 feet
95 percent of these small airplanes	3,090 feet
100 percent of these small airplanes	3,650 feet
Small airplanes with 10 or more passenger seats	4,280 feet
Large airplanes of 60,000 pounds or less	
75 percent of these large airplanes at 60 percent useful load	4,710 feet
75 percent of these large airplanes at 90 percent useful load	6,830 feet
100 percent of these large airplanes at 60 percent useful load	5,510 feet
100 percent of these large airplanes at 90 percent useful load	8,500 feet

Source: FAA Airport Design software.

The second method used for runway length determination is presented in FAA Advisory Circular 150/5325-4B Runway Length Requirements for Airport Design. Using the nomograph for Small Airplanes having 10 or more Passenger Seats and data for PMP produces a runway length requirement of approximately 4,200 feet. Because of inherent imprecision in the use of nomographs, the consultant recommends that the 4,300-foot length referenced above be used as the planning standard for PMP's primary runway length.

On the basis of this information, the existing primary runway length of 4,418 feet is sufficient; however, review of existing airport layout plan (1997 study) indicates that Runway 33 was depicted with a Visual Flight Rules approach surface having a 20:1 slope. Since that time, a nonprecision approach has been added to Runway 33; this requires a 34:1 approach surface slope. This change creates a lack of clearance over N.E. 10th Street that could require relocation of the RWY 33 threshold thereby creating a need to lengthen the runway on the 15 end. That issue will be

examined further in the next chapter.

With respect to other runways at PMP, FAA has long used a general guideline that a crosswind runway be at least 80 percent of the length of the primary runway. Given a primary runway length requirement of 4,300 feet, Runways 6-24 and 10-28 both meet this guideline.

Regarding runway width, the FAA's standard for B-II airplanes is 75 feet for runways with visual approaches and instrument approach procedures with minimums not lower than ¾ statute mile. The present runway width is 150 feet for 15-33 and 6-24. Runway 10-28 is 100 feet wide. All runways exceed the recommended width. When runway pavement rehabilitation is programmed, consideration should be given to the benefits and costs of retaining the existing 150-foot width versus designing the runway for the recommended 75-foot width rehabilitation/reconstruction is recommended.

3.1.3 Wind Coverage

FAA guidelines suggest that a runway or runway system should provide coverage for 95% of crosswinds. Examination of the all-weather wind rose in Figure 3.1 and the information in Table 3.2 shows that the existing runway system provides approximately 96.3% coverage for crosswind components of 10.5 knots or less. None of the runways individually provides the recommended 95% coverage for the 10.5 crosswind component applicable to the types of aircraft most commonly used at PMP; as a consequence, it is recommended that a crosswind runway configuration be maintained.

Within that context, this master plan will examine the potential closure of one runway during the 20-year planning period. This should be accomplished for several reasons, namely:

- Adequate wind coverage (> 95 percent) is provided by a combination of any two runways.
- FAA methodologies indicate that the third runway in an intersecting configuration does not add to capacity; it is considered as adding convenience.
- Given adequate coverage by two-runway configuration, the third runway is not eligible for FAA matching funding.
- Closure of a runway would add land to the area available for landside facilities, as needed.
- Closure of a runway could reduce noise impacts for certain areas near the airport.

Given these considerations, the analysis of alternatives will examine closure of one runway as an option during the planning period.

Figure 3.1: All Weather Wind Rose

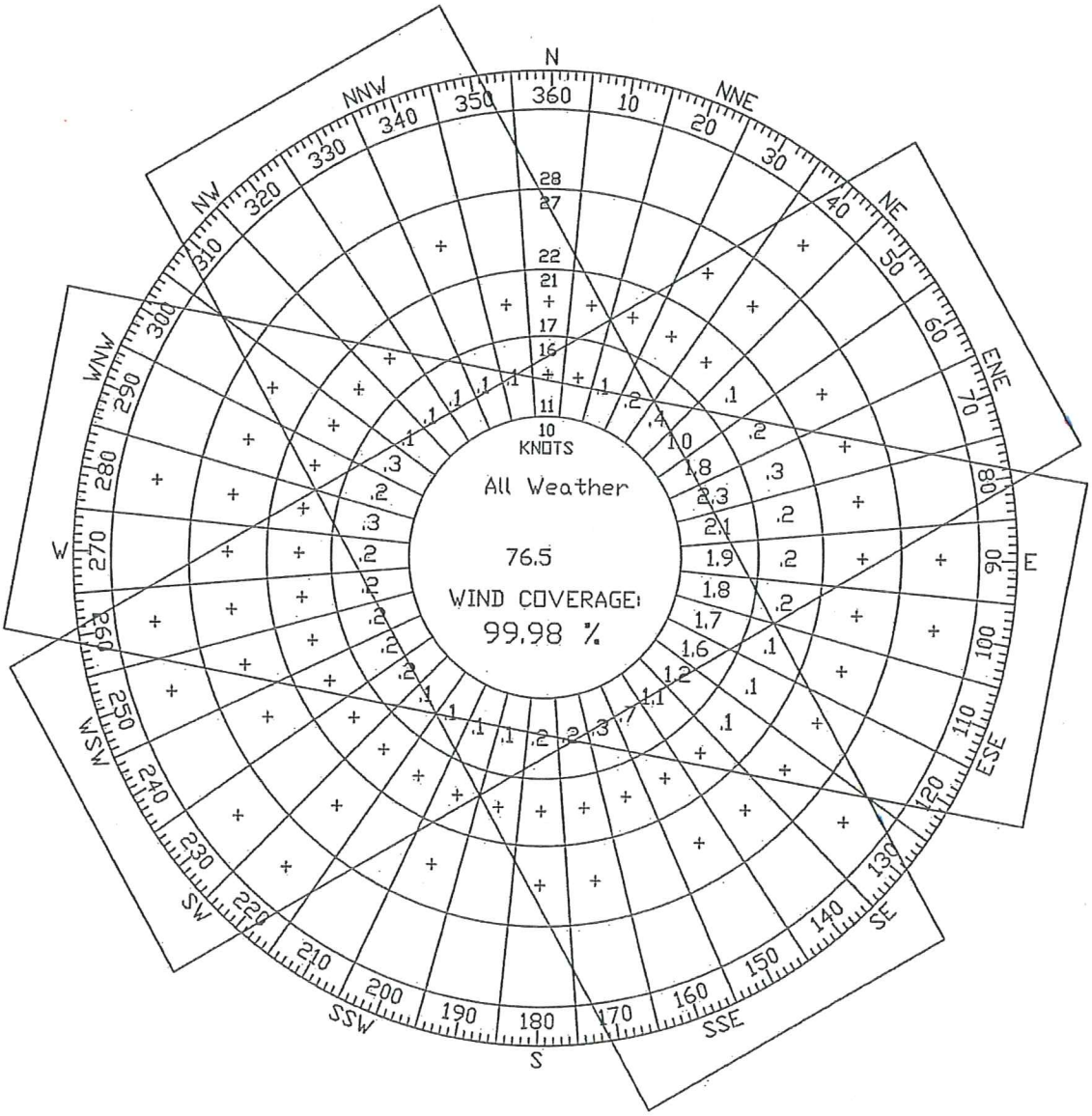

Table 3.2: WIND COVERAGE (PERCENT)				
	Wind Velocity			
RUNWAY	10.5 KTS	13 KTS	16 KTS	20 KTS
6-24	92.48	96.50	99.49	99.93
15-33	86.86	92.84	98.45	99.74
10-28	96.22	98.68	99.80	99.96
COMBINED	99.92	99.98	100	100

Source: National Climatic Center, Asheville, NC
Station: Venice Pier – Venice, FL
Period: 1995-2005

3.2 Airside Facility Requirements

For the purposes of this report, the airside facilities of an airport are the runway configuration, its associated taxiway system, and any visual or electronic navigational/landing aids. Future needs for these facilities were determined based upon forecasts of aviation demand, in particular projected levels of aircraft operational activity and aircraft fleet mix. Guidelines from FAA AC 150/5300/13 *Airport Design* were used.

3.2.1 Airfield Design Guidelines and Standards

The FAA has developed guidelines for airport geometry. These include specifications for Obstacle Free Zones (OFZ), Runway and Taxiway/Taxilane Object Free Areas (ROFA/TOFA), Runway and Taxiway Safety Areas (RSA/TSA), Runway Protection Zones (RPZ), aircraft holdline dimensions, and FAR Part 77 Airspace Surfaces. The dimensions recommended by the FAA for runways serving B-II Design Aircraft and with visual and instrument approach minimums >3/4 mile and are shown in Table 3.3. Specific design dimensions applicable to airfield alternatives will be discussed in the next chapter.

3.2.2 Runway Grades and Line-of-Sight

The recommended maximum longitudinal runway grade is ±2.0 percent for airplanes in Approach Categories A and B. In the absence of a full parallel taxiway, gradient changes shall be such that any two points 5 feet above the runway centerline shall be mutually visible for the full length of the runway. PMP meets this requirement.

For airports with intersecting runways, the FAA recommends a clear line-of-sight between the ends of runways. The determination of the runway visibility zone (RVZ) for airports with intersecting runways reflects the distance of runway ends from the point of intersection of the centerlines of the runways. Examination of an aerial photograph of the airport indicates no conflicts with this standard with the exception of the area north of the intersection of Runways 15-33 and 10-24. An area of trees will require removal in order to conform to FAA standards. This area will be depicted in the Airport Plans Package in the final report for this study.

3.2.3 Pavement Strength

Aircraft using PMP are limited to a gross weight of 30,000 pounds or less on Runway 15-33. Runways 10-28 and 6-24 have weight limits of 12,500 pounds. One effect of these limitations is to restrict larger heavier aircraft to Runway 15-33. Review of the wind rose data indicate that Runway 15-33 provides more than 95 percent coverage of crosswind components of 13 knots and greater; therefore, the weight limits on secondary runways does not impose an undue burden on operators of large aircraft. It is recommended that future runway pavement projects use the 30,000-pound and 12,500-pound design standards.

Taxiways serving Runway 15-33, notably Taxiways B and D, should be maintained at 30,000 pounds strength. Other taxiways may also require this strength based upon the final airfield and landside development alternatives recommended. Standards for local tie-downs and itinerant ramp should be reviewed based upon the types of aircraft using these facilities as additional development occurs on the airport.

3.2.4 Taxiway System

All runways have associated parallel taxiways as described in Chapter 1 and illustrated in Figure 1.2. The FAA standard for taxiways serving B-II Design Aircraft is 35 feet wide. The taxiways at PMP meet or exceed this standard.

Because of the high levels of existing and forecast operations at PMP, full parallel taxiways are recommended for all runways. These should be 35 feet wide and located a minimum of 240 feet centerline-to-centerline from the runway. Taxiway M, the inboard parallel taxiway for Runway 6-24, is 200 feet centerline-to-centerline from the runway; this fails to meet the B-II standard of 240 feet. The Taxiway K serves Runway 10-28 and is also located 200 feet centerline-to-centerline from runway. It does not meet the B-II separation standard.

Table 3.3 Airfield Design Standards

Design Standard/Surface	Design Standard for Approaches with visual and not lower than ¾-mile approach visibility minimums, Approach Category B, Design Group II Airplanes
Runway Width	*75 feet (See discussion.)*
Runway Object Free Area	500 feet wide, longitudinally centered about the runway centerline and extending 300 feet beyond each runway end
Runway Safety Area	150 feet wide, centered longitudinally on runway centerline, extending 300 feet beyond each runway end
Runway Protection Zones	Begins 200 feet beyond each runway end, with an inner width of 500 feet, an outer width of 700 feet, and a length of 1,000 feet **(Note: Standard is for visual and not closer than 1-mile minimums)**
Runway to Parallel Taxiway	Minimum 240-foot separation, centerline-to-centerline
Runway to Aircraft Parking	Minimum 250-foot separation, runway centerline to parking
Taxiway Safety Area	79 feet wide
Taxiway Width	35 feet wide
Taxiway/Taxilane Object Free Area	131 feet wide
FAR Part 77 Primary Surface	500 feet wide, longitudinally centered on runway centerline, extending 200 feet beyond each runway end

The number and location of any additional exit taxiways and reconfiguration or extension of parallel taxiways will be considered in the analysis of alternatives and depicted on the Airport Layout Plan.

3.2.5 Airfield Lighting

All runways are equipped with Medium Intensity Runway Lights (MIRLs) and threshold marker lights. Runway ends 6, 10, and 33 are equipped with Runway End Identifier Lights (REILs). Runway 15 also has an Omnidirectional Approach Lighting System (ODALS). The ODALS is adequate for Approach Procedures with Vertical Guidance (APV-RNP) and for other nonprecision approaches.

With the exception of Taxiway F, the taxiway system is equipped with Medium Intensity Taxiway Lights (MITLs). Construction of additional taxiways and any extensions of the parallel taxiway system should be accompanied by installation of MITLs.

3.2.6 Airfield Marking and Signage

With the exception of Runway end 15, all runway ends are provided with basic marking. All runway centerlines are also marked. Runway 15 is equipped with nonprecision marking including threshold markings, runway designation marking, and aiming points. Runway 3 also has aiming points.

Runway ends 6, 24, and 33 also have published nonprecision instrument approaches. These runway ends should be appropriately marked. Runway 10-28 is visual only and is appropriately marked.

The airfield at PMP is equipped with signage typical of an airport of its type. As runway and taxiway improvements are completed, the locations of existing and new/replacement signs should be reviewed and installations made that conform to FAA guidelines.

3.2.7 Instrument Approach Capability

Runways 15-33 and 6-24 have published instrument approach procedures producing straight-in nonprecision capabilities. Given the high level of activity at the airport, particularly in flight training, improvements to this capability should be examined. An Approach Procedure with Vertical Guidance (APV-RNP) for Runway 15, for example, could provide improved minimums and could be supported by the existing ODALS equipment. The merits of improved approach procedures will be considered in the analysis of alternatives.

3.3 Landside Facility Requirements

This section describes the guidelines and methodologies used to develop facility requirements for the landside areas of the airport. These were estimated using forecasts of aviation demand and FAA guidelines. The following categories were examined:

- Hangars and Hangar Apron
- Local Aircraft Apron
- Itinerant Aircraft Ramp
- Terminal Facility
- Air Traffic Control Tower
- Auto Parking and Ground Access
- Fuel Storage

3.3.1 Hangars and Hangar Apron

Several factors influence hangar requirements, e.g., the number of based aircraft, the physical characteristics of these aircraft, aircraft owner preferences, and the local climate. The majority of PMP's based aircraft are stored in T-hangars. Currently, the airport has 118 units with 10 additional units under construction to replace Building 109, which was destroyed by a hurricane in 2006.

Conventional hangars are limited to the FBO hangar occupied by Anthony Aviation, the blimp hangar used to house the Goodyear blimp, and a smaller hangar occupied by American Flyers, a flight training operation. The FBO hangar is used to store and maintain aircraft including two based jets. For planning purposes, it was considered as housing four aircraft. The American Flyers hangar was considered a maintenance hangar with blimp hangar not viewed as a dedicated facility not to be considered for other purposes.

Using the Form 5101 based aircraft number (158) and a total of 128 T-hangars available following reconstruction of building 109, local practice would seem to be to provide T-hangar storage for approximately 80 percent of based aircraft. Lacking definitive information concerning T-hangar occupancy rates, the consultant prepared calculations using a somewhat more conservative 75 percent factor. This would suggest the need for 64 additional T-hangars during the planning period. Table 3.4 summarizes T-hangar requirements by planning phase (5-year, 10-year, and 20-year horizons).

The additional requirement for the planning period represents a 50 percent increase in total T-hangars. Given the absence of reliable occupancy data, the relatively small increase in units for the 2012 planning horizon should be reviewed as development proceeds to ensure that adequate facilities are available. The analysis of landside alternatives in the next chapter will consider areas suitable for such development.

Table 3.4: Recommended T-hangar Requirements		
Year	**Number of T-hangars Existing or Recommended**	**Increase from Previous Period**
Existing (2007)	128	N/A
2012	138	10
2017	172	34
2027	192	20
Total Additional Requirement		64

With respect to conventional hangars for storage, FBO, and other facilities and services, proposals have been made for construction of two additional box hangars totaling approximately 15,000 square feet of floor space. The forecasts presented in Chapter anticipate growth in both multi-engine and jet aircraft based at PMP. In the consultant's view, owners and operators of these equipment types are more likely to generate additional demand for conventional hangars. As a result, it is recommended that space be reserved for two conventional hangars in the short- to intermediate-term (in addition to those now proposed) with expansion capability provided for two more in the long-term. It is anticipated that these buildings would be in the range of 3,600 square feet to 6,000 square feet each totaling approximately 19,200 square feet of additional hangar storage. Consistent with airport planning guidelines, an area of hangar ramp equal to the area of the hangars should also be provided.

3.3.2 Local Aircraft Apron

Areas of paved aircraft parking for local aircraft are concentrated in two locations at PMP. A generally east-west oriented strip of asphalt pavement has been constructed adjoining Taxiway L on its south side. This pavement measures approximately 2,100 feet x 75 feet with wider areas in some locations. Much of this strip lies inside the Taxiway Object Free Area for Taxiway L and, therefore, does not meet standards. This is supplemented by an area in from of the FBO that measures approximately 450 feet x 250 feet. (All measurements are based upon estimates of areas dedicated to aircraft parking and net of taxilanes.)

The discussion of T-hangar requirements noted an estimate that approximately 75 percent of based aircraft would be stored in hangars. Consequently, estimates of apron for storage of based aircraft were calculated using the forecasts and a factor of 25 percent for determining the number of tie-downs required. Calculation of the recommended area was based upon a standard of 300 square yards per aircraft, which includes taxilane access. The recommended areas are as follow:

Year	Spaces	Area in Square Yards
2012	46	13,800
2017	51	15,300
2027	65	19,500

The analysis of alternatives should include provision for this area in the proposed landside development.

3.3.3 Itinerant Aircraft Ramp

The ramp area required to meet the temporary aircraft parking requirements generated by itinerant aircraft was estimated using guidance in FAA AC 150/5300/13, *Airport Design*. Based upon the forecast of itinerant operational activity, requirements can be formulated with the following five-step methodology:

Step 1 produces estimated peak month itinerant operations by assuming them equal to 10 percent of annual itinerant operations. Step 2 estimates average daily itinerant operations from the peak month, from Step 1, dividing it by 30. In Step 3, it is assumed that the busy itinerant day is 10 percent more active than the average day. Step 4 was modified from the FAA's approach. That methodology uses the final assumption that parking will be needed for 50 percent of the itinerant aircraft during the busiest day of the peak month. Because many of the operations experienced at PMP are itinerant training activity, space estimates were based upon the use of 20 percent as requiring ramp. Finally, 360 square yards per aircraft is used space requirements. Table 3.5 depicts the cumulative results of this analysis.

Table 3.5: Estimates of Itinerant Ramp Requirements

Year	Itinerant Operations				Total Spaces Needed	Area (Sq. yds.)
	Annual	Peak Month	Average Daily	Busy Day		
2012	52,137	5,214	174	191	38	13,680
2017	57,365	5,737	191	210	42	15,120
2027	71,960	7,196	240	264	53	19,080

Consideration will be given in the analysis of landside alternatives to the areas suitable for these facilities.

3.3.4 Terminal Facility

The existing terminal building comprises 2,600 square feet and houses the airport management offices as well as the air traffic control tower. These are its principal purposes; its location is not convenient for use by pilots and passengers. Other general aviation terminal facilities are provided by the FBO. It is anticipated that these roles will continue into the future.

For general planning purposes, the FAA has formulated guidelines for calculating general aviation terminal requirements that utilize airport operational peaking characteristics. The method relates the number of peak hour pilots and passengers to the functional areas within the terminal. The product of the analysis is an overall building size.

As noted with respect to airport access and parking, many aircraft owners do not use existing auto parking. These owners would also be less likely to use a general aviation terminal facility than would pilots/passengers associated with itinerant operations. For this reason, only the itinerant pilots and passengers were considered in calculating general aviation terminal facility requirements.

FAA guidelines suggest that a ratio of 49.0 square feet per peak hour pilot/passenger be used to calculate general aviation terminal building floor space requirements. Using this approach and the forecasts for itinerant passengers and pilots, requirements for general aviation terminal building space were calculated by multiplying design hour operations by 1.8 to estimate pilots and passengers. These numbers were then multiplied by 49 square feet per pilot/passenger to estimate terminal building space requirements. The results were as follows:

- 2012 3,600 square feet
- 2017 4,000 square feet
- 2027 5,000 square feet

(Numbers are rounded.)

Terminal requirements are currently met by space for airport management and staff in the airport administration building as well as space in the FBO building that accommodates passengers, pilots and FBO personnel. These structures are shown in Figures 3.2 and 3.3

Figure 3.2: Administration Building and Control Tower

Figure 3.3: FBO Building

As can be seen from the photographs, the air traffic control tower and administration building is an older structure. The most recent Capital Improvements Plan recommended renovation; it was also recommended that

consideration be given to a new tower at a different location due to line-of-sight limitations from the current facility. These options will be examined in the analysis of alternatives. It should be noted that selecting a location for an ATCT requires a tower siting study. It is recommended that the study be completed early in the 20-year planning period in order to ensure reservation of an appropriate area for this development.

3.3.5 Ground Access and Parking

Immediate access to the primary landside areas at PMP is provided by N.E. 10th Street, a two-lane road. Driveway entrances are provided at two points; the easternmost serves the FBO and T-hangar areas while the westernmost gives access to the administration building/air traffic control tower, American Flyers, and other facilities and services.

The blimp hangar is located on the west side of the airport. Access to this area is via N.E. Fifth Avenue, a two-lane road.

These area access roads are considered adequate for existing and future needs; however, on-airport access is deficient. PMP has no perimeter service road, and no access is available to the northeast side of the airfield. The Capital Improvement Plan Update and Noise Contour Map (May 2003) recommended construction of a service road on the west side as well as access roads to undeveloped parcels on the west side. This master plan concurs with those recommendations, but will also consider access to the northeast side of the airfield in the examination of landside alternatives.

With regard to auto parking, a frequently used rule-of-thumb is the provision of 1.3 parking spaces per design hour operation. The consultant's experience at general aviation airports such as PMP suggests that an alternative methodology is applicable, because owners/operators of based aircraft frequently park their surface vehicles in their hangars while their aircraft are in use. For the purposes of this study, the following methodology was used:

- Design hour itinerant pilots and passengers were calculated as described in the development of terminal requirements presented in earlier in this chapter.
- Consideration was given to providing parking spaces for ten percent of design hour pilots and passengers generated by local operations.
- Total parking spaces for pilots and passengers were estimated by multiplying design hour pilots and passengers by 1.3.
- Total parking spaces required for pilots and passengers were calculated and increased by 10 percent to provide spaces for employee parking.

This methodology produced the following estimates of parking spaces required:

- 2012 116 spaces
- 2017 128 spaces
- 2027 161 spaces

These numbers suggest that existing parking is adequate in number; however, an inspection of the airport revealed deficiencies in the distribution of spaces. For example, the terminal/tower building has 12 spaces to its south. These are frequently filled. Further, the parking lot provided for American Flyers was observed in overflow condition with vehicles parked on the grass. Consideration should be given in the alternatives to increasing the number of spaces available for both of these facilities.

3.3.6 Fuel Storage

Primary fuel storage consists of two underground 15,000-gallon tanks maintained by the FBO. One is used for Avgas; the other two are for Jet A. A third aboveground 10,000 gallon Avgas storage tank is maintained by American Flyers, but it is for that flight instruction operation's exclusive use and is not fuel for sale.

Space is available in the FBO fuel farm area for additional storage; further, space is also available for additional FBO locations that could include fuel storage. On this basis, existing storage was considered adequate and subject to the addition of FBOs rather than an increase in operations.